The letters N. and M. following the names, indicate that the species was also found by me in the Pleistocene on San Nicolas and San Miguel Islands, respectively. On these islands, also the deposit was on the top of the mesa. On San Nicolas, Pleistocene shells are found at various levels, but excepting those near the top, they are under suspicion of having come down the slopes with the talus. These finds of Pleistocene shells on the islands are of considerable importance as indicating that the islands were nearly submerged. But the land shells, on a deposit above the marine beds, appear to prove that there was always some emergent land. This is also indicated by the plants.

On San Nicolas, on the slopes, marine and land shells are sometimes found mixed, but careful examination shows that the latter are all from a superficial deposit later than that carrying the marine shells.

TYPE SPECIMEN OF *BUSYCON PERVERSUM* (*MUREX PERVERSUS* LINNÉ)

BY BURNETT SMITH

This note is made possible through the liberal policy of The Linnean Society of London in granting permission to publish photographs of the type of *Murex perversus* Linné. Mr. R. Winckworth of London has very kindly examined the specimen for the writer, and Dr. Henry A. Pilsbry of the Academy of Natural Sciences of Philadelphia has contributed many helpful suggestions. To the Linnean Society and to these gentlemen the writer wishes to express his thanks. Plate 7, figs. 1, 2 are reproductions of the type photographs.

The desirability of consulting the Linnean type was suggested by Hanley's discussion of *Murex perversus*.[1] He says: "The *Pyrula perversa* of authors (Reeve, Conch. System, pl. 236, f. 5) is marked for this shell in the Linnean collection, and 'List. 907, 908' has been added in the revised copy of the 'Systema.' All the synonyms are usually accepted as correct, but Gualtieri's engraving (manifestly taken from a broken example), in the

[1] Hanley, Sylvanus: Ipsa Linnaei Conchylia. London 1855. See p. 302.

multiplicity of modern illustrations, is not worthy of being quoted.''

Hanley is presumably referring to one of two figures in Gualtieri[2] which, in spite of their shortcomings, depict the slender left-handed or sinistral *Busycon* long known as *B. perversum* (L.) The figures in Lister[3] given by Hanley likewise show the same phase of slender left-handed *Busycon*. If, however, one consults the Reeve[4] figure cited by Hanley it is found to show a young individual of the robust and long-spined sinistral *Busycon* variously known as *B. kieneri* (Philippi), *B. perversum* var. *kieneri*, and *B. perversum kieneri*.

The writer has examined rather extensive sets of recent sinistral Busycons and the evidence so far gathered points to the specific distinctness of the slender and robust phases just mentioned. Were the differences between them of lower than specific rank there should be many intergrades. The latter are not forthcoming in the recent fauna.

Busycon kieneri (Philippi)[5] is based on Kiener's figure of an immature individual clearly referable to the robust phase. Adult examples of this phase are heavy and far from slender, provided with a few long spines on the last whorl, and with the anterior canal showing a prominent swelling or swollen band crossing it diagonally. The entire aspect of this form is so like a ''mirror image'' of the usual adult dextral *Busycon eliceans* (Montfort)[6] that the view has been expressed that these sinistral shells are in reality merely teratological examples of this normally dextral

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[2] Gualtieri, Nicolai: Index Testarum Conchyliorum. Florentiae 1742. See pl. 30, fig. B.

[3] Lister, Martin: Historia Sive Synopsis Methodica Conchyliorum. Editio Tertia. (Dillwyn, 1823.)

[4] Reeve, Lovell: Conchologia Systematica, etc. London 1842. See vol. II, pl. 236, fig. 5.

[5] Philippi, R. A.: Kurze Beschreibung einiger neuen Conchylien. Zeitschrift für Malakozoologie. Fünfter Jahrgang 1848. Cassel 1849. See p. 98 and reference to Kiener's figure.

Kiener, L. C.: Spécies Général et Iconographie des Coquilles Vivantes, etc. Vol. 6, Pyrula, 1840. See pl. 9, fig. 2.

[6] Montfort, Denys De: Conchyliologie Systématique. Tome Second. Paris 1810. See pp. 502–504 and figure.

species.[7] Kiener, on the other hand, and quite recently Johnson[8] make sinistrality the bond between the slender and robust left-handed Busycons and regard their differences as varietal or subspecific. As stated above, the present writer has obtained no evidence so far in favor of this latter view. Linking the robust left-handed shells with *Busycon eliceans* would seem more logical but until overwhelming evidence supports such a practice its adoption is opposed. To make *Busycon kieneri* and *B. eliceans* conspecific would involve a nomenclatorial tangle which will be noted beyond.

From the standpoint of its two original figure citations *Murex perversus* Linné[9] appears to include two distinct species. One of these is pictured by the figure in Gualtieri (pl. 30, fig. B), already considered, representing a slender sinistral shell. The other species, figured in Argenville,[10] shows the robust sinistral form later to be known as *Busycon kieneri* (Philippi).

Röding's[11] genus *Busycon* contains a *B. perversum* among its original species. No author is given but rather surely the *Murex perversus* of Linné is intended. The figure or figures cited by Röding are to be found in Chemnitz (Martini)[12] and they illustrate the slender phase of sinistral *Busycon* which, as already noted, is shown in Gualtieri's figure of the broken shell.

It is plain that the specific name *perversum* should be applied to but one of these two forms of *Busycon*. The revisions of Kiener and of Philippi, if so they may be termed, have resulted in the fastening of the name *perversum* to the slender shell while the robust one has done duty as variety or subspecies of *Busycon*

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[7] Tryon, George W., Jr.: Manual of Conchology, etc. Vol. III. See p. 141 also pl. 57, fig. 390.

[8] Johnson, Charles W.: List of Marine Mollusca of the Atlantic Coast from Labrador to Texas. Boston Soc. Nat. Hist. Proc. Vol. 40, no. 1. 1934. See p. 126.

[9] Linnaeus, Carolus: Systema Naturae. Tomus I. Editio Decima, Reformata. 1758. See p. 753.

[10] Argenville: L'Histoire Naturelle, etc. Paris 1742. See pl. 18, fig. F.

[11] Röding, Peter Friedrich: Museum Boltenianum, etc. 1798. See p. 149.

[12] Chemnitz, Johann Hieronymus: Neues systematisches Conchylien-Cabinet. Neunten Bandes, erste Abtheilung. Nürnberg 1786. See vol. IX, pl. 106, fig. 902.

perversum, as a distinct species (*B. kieneri*), or as a sinistral monstrosity of *B. eliceans*.

Apparently no one has so far considered the type specimen of *Murex perversus*. When photographs of this type are examined it becomes clear that the name *Busycon perversum* (Linné) should be applied henceforth to the robust form described as a distinct species by Philippi, and that *B. kieneri* (Philippi) must unfortunately be placed in the synonymy.

The elimination of *Busycon kieneri* involves the question of the validity of *B. eliceans* and perhaps also of *B. carica* (Gmelin).

The trouble does not end here for a name must be found for the slender sinistral *Busycon*.

For this purpose at least two names should be investigated. The older of these *Fulgur contrarius*, was used by Conrad[13] in describing the left-handed *Busycon* of the Duplin Miocene at the Natural Well in Duplin County, North Carolina. The later name, *Busycon adversarium*, also of Conrad,[14] was attached by him to a shell figured by Tuomey and Holmes.

Busycon adversarium appears to be founded upon a fairly mature example of *B. contrarium*, and the name is therefore a synonym for the latter species. The proper disposition of the recent slender sinistral Busycons is full of many difficulties. For the present, however, it seems best to regard them as a race of *Busycon contrarium* (Conrad).

Explanation of Figures, Plate 7

Type Specimen of *Murex perversus* Linné. Long dimension about 74 mm. Photographs by the Linnean Society's photographer.

Fig. 1. Specimen with aperture turned toward observer.

Fig. 2. Apical view.

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[13] Conrad, T. A.: New fossil Shells from N. Carolina. Amer. Journ. Sci. 39. 1840. See p. 387.

Conrad, T. A.: Fossils of the Medial Tertiary or Miocene Formation of the United States, No. (4). 1861. (Republication of 1893 by William Healey Dall.) See p. 81 and pl. 45, fig. 11.

[14] Conrad, T. A.: Catalogue of the Miocene Shells of the Atlantic Slope. Acad. Nat. Sci. Philadelphia, Proc. XIV. 1862. See p. 560.

Tuomey, M. and F. S. Holmes: Pleiocene Fossils of South-Carolina. 1857. See p. 145 and pl. 29, fig. 3.